Risk Analysis: Evaluation of Risk to the United States (US) of Importing Foot and Mouth Disease (FMD) Virus in Fresh or Frozen Beef from Argentina

Animal and Plant Health Inspection Service
Policy and Program Development
Veterinary Services

December 4, 2000

Risk Analysis: Evaluation of Risk to the United States (US) of Importing Foot and Mouth Disease (FMD) Virus-Infected Fresh or Frozen Beef from Argentina

Hazard identification:

The Animal and Plant Health Inspection Service (APHIS, Veterinary Services (VS), defines the hazard as the probability of incursion of FMD-infected fresh beef from Argentina into the US and virus spread to US livestock. The hazard is associated with an August 11, 2000, report from the Government of Argentina that ten bovines, four of which were serologically positive for FMD virus, had entered Argentina illegally from Paraguay [1, 2]. Virus was isolated subsequently from one of the animals.

APHIS is conducting this qualitative risk analysis to evaluate the effect of FMD isolation on the results of a quantitative APHIS risk analysis conducted in August 1997 [3]. Specifically, the current risk analysis considers the effect of the isolation on the risk of importing fresh and frozen beef from Argentina under the US import restrictions in place at the time of the isolation [4].[1]

Background:

Before August 1997, APHIS prohibited the importation of fresh and frozen beef from Argentina because APHIS did not recognize Argentina as FMD-free. APHIS conducted a quantitative risk assessment [3] in June 1997 that evaluated import conditions designed to mitigate FMD risk. A regulation allowing the importation of fresh beef from Argentina, published as a Final Rule effective on August 25, 1997, specified import conditions intended to mitigate the risk of FMD virus in fresh and frozen meat. These conditions included maturation of beef in chillers so that the meat reached a pH of 5.8 or less, certification of animal origin, removal of bone and lymph nodes, and prohibition of co-mingling.

Subsequently, based on information that bovine parts (i.e., heads, feet, hooves, and internal organs) that APHIS did not classify as fresh and frozen beef were being imported, that rule was revised. An Interim Rule became effective on June 28, 2000 [6], prohibiting the importation of the bovine parts mentioned, since they were not routinely included with carcasses placed in chillers for maturation. The rule additionally required ante-and post-mortem inspections of animals from which fresh beef intended for importation into the United States originated and required that APHIS representatives be allowed access to slaughtering establishments for periodic inspections.

On August 11, 2000, Argentina reported that ten bovines had entered Argentina illegally from Paraguay. FMD virus was isolated from one of these animals [1, 2, 5].

[1] Of note in this regard is that US import risk from the outbreak has been mitigated since August 2000 by a ban placed by Argentina on exports of fresh beef to the US [5].

At the request of the US, Argentina agreed to discontinue immediately certification of beef for export slaughter to the US. Argentina now requests that it be permitted to resume certification.

APHIS, VS Staff conducted a site visit between September 27 and October 6, 2000. Personnel from the Office International des Epizooties (OIE) also evaluated the situation. This risk analysis is based primarily on information presented in the VS site visit report [5], information posted on the OIE home page [1], and an epidemiological report provided by the Government of Argentina [2].

The 1997 APHIS Risk Analysis

The quantitative 1997 risk assessment that APHIS conducted relied primarily on information supplied by the Government of Argentina and a site visit report generated by VS Staff [7]. The assessment was limited to a release assessment as defined in the OIE International Animal Health Code [8]. Its endpoint was the expected frequency with which FMD-contaminated beef would be imported from Argentina and enter the US.

This assessment considered three risk pathways:

- Exported meat originated from infected carcasses from which bones and lymph nodes were properly removed. However, the meat was not properly matured.

- Exported meat originated from infected carcasses from which bones and lymph nodes were properly removed and the meat was properly matured. However, the maturation process failed to kill FMD virus.

- Exported meat originated from infected carcasses. However, the bones and lymph nodes were not properly removed, and the meat was not properly matured.

The analysis assumed that acute outbreaks of FMD in Argentina would be quickly detected, and exports would be terminated before infected animals were slaughtered for export of beef to the US. Thus, the analysis focused only on the probability that undetected FMD-infected chronic carrier animals would be slaughtered for export.

The analysis reported that the expected (i.e., 50% confidence level), cumulative value of the time to first importation of an FMD-contaminated side of beef is slightly less than 1000 years (or less often). VS estimated that the probability/risk that fresh beef imported from Argentina into the US would be infected with FMD was extremely low.

APHIS Staff now considers the probabilities generated in the 1997 risk assessment as overestimates of risk for the following reasons.

- The mathematical model did not consider dependence among animals. Specifically, the model did not recognize that, if FMD were detected anywhere in the country (including in a slaughtered animal) all exports would cease

pending further investigation and evaluation. This action by the Government of Argentina should significantly reduce the estimated risk.

- The model did not consider transit time. VS Staff estimated the time between departure of beef from an Argentine slaughter plant to arrival in the US as approximately four weeks. If FMD were diagnosed in Argentina, APHIS Staff considered it likely that disease would be detected within four weeks. This should provide an adequate opportunity for Argentina to inform VS of the problem and for VS to intercept potentially infected beef before distribution in the US.

- The analysis assumed that chronic carriers rather than acutely infected animals were the primary source of risk. However, these might not be the sole source. On the one hand, acutely infected, incubating animals might constitute a primary source of concern in unvaccinated populations. On the other hand, reports of the incubation period for FMD range from 3-5 days [9] to 14 days [10]. In either case, disease would probably be detected before infected beef arrived in the US.

The August 2000 FMD Outbreak

Before August 2000, the last reported case of FMD in Argentina was in April 1994. Argentina continued to vaccinate cattle for FMD until April 1999, at which time vaccination was suspended [5]. Subsequently, in accord with the time frame defined by OIE standards [10], Argentina requested recognition as a country free of FMD without vaccination.

However, a series of reports regarding FMD in Argentina began in August 2000 [1, 5] after observations of FMD in Paraguay. On June 5, 2000, a private Argentine veterinarian working in Paraguay notified Argentine veterinary authorities of the diagnosis of the occurrence of FMD in Paraguay. In response, Argentina increased surveillance along the border. On August 11, ten animals that had been illegally brought across the border were identified. Serological responses to FMD virus were positive in four of the ten animals; virus was isolated from one.

Serological responses were positive in eight of 82 direct contact animals; no attempts were made to isolate virus from these animals. Thirteen shipments containing a total of 391 animals from adjacent premises were identified. Three additional animals were detected that were serologically positive.

The group of ten animals in which the diagnosis was confirmed initially, all animals on adjacent premises, and all animals on premises receiving shipments from the adjacent premises (a total of 3,563 animals) were slaughtered. In total, positive serological responses were detected in eleven Argentine cattle and four cattle imported illegally. None of these animals displayed clinical signs. Virus isolation was attempted only in the original ten animals.

Although specific estimates of virus spread were variable, none of the estimates indicated that disease spread was extensive. As previously mentioned, the total number of affected animals reported was eleven animals out of 3,563. However, most of these animals were reported as infected because of positive serological responses, not virus isolation. Because none of the animals displayed clinical signs, it is possible that the positive serology in some animals might have reflected vaccination. At the time of this report, additional spread had been detected.

The Revised Risk Analysis

The information available on the August 2000 outbreak indicated that the incident, which resulted from illegal animal movement, had been contained. The qualitative analysis of the incident and the response by the Argentine government suggested that the probability that Argentine beef will introduce FMD into the US estimated in the 1997 risk assessment was unaffected. Therefore, risk of importing FMD infected meat to the US from Argentina was unaffected. VS based its evaluation on the following points.

- The 1997 risk assessment did not consider the potential for illegal cross-border movements because APHIS had no relevant data to model such events. The new evidence suggests that illegal cross-border animal movement occurs. However, the new evidence also suggests that, when affected animals are introduced into Argentina, serological responses are detected quickly.

  The observation is consistent with the assumption made in the 1997 risk assessment, that Argentina would quickly detect acute indications of FMD. In fact, Argentina did detect the animals affected in August 2000. Virus was isolated from only one illegally imported animal and no spread was observed. While this does not prove the validity of the 1997 assumption in all cases, Argentina's rapid detection of and response to the incursion provides evidence that the assumption was reasonable in 1997 and remains so today.

  Rather than increasing the level of concern, the events associated with the August 2000 incident in Argentina provided confidence that Argentina's procedures for detecting illegal animal movements, diagnosing FMD, and controlling disease spread were effective. Only if Argentina had failed to detect illegal animals promptly or to diagnose FMD before the disease had spread significantly would there be cause for concern. FMD surveillance appeared to be at least as effective as it had been in the past and could be considered more effective.

- The 1997 risk assessment assumed that the most likely number of animals infected with FMD virus in Argentina in any given year was zero and that the maximum possible number of undetected, infected animals was ten. The evidence that FMD spreads rapidly in a susceptible animal population; that Argentina has a large population of swine, sheep, goats, and young, unvaccinated cattle; that no outbreaks of FMD have been reported in Argentina in 1997, 1998,

and 1999; and that FMD virus was isolated from only one animal in the year 2000, suggested that the 1997 assumption was reasonable and remains so today.

- The 1997 risk assessment did not consider the effect of transportation time to the US for Argentine beef on FMD risk. Argentine beef is transported to the US by cargo ship. VS-NCIE staff estimated that transit time from Argentina to the US is approximately 28-30 days. If FMD were diagnosed in Argentina, VS would restrict all beef either in transit or not yet distributed at the time of diagnosis. Therefore, for an FMD outbreak in Argentina to pose a risk to the United States, an outbreak must remain undetected for at least 28-30 days. Clinical signs should appear between 3 and 14 days, depending on the age and vaccination status of the animal. This suggests that detection is likely within the usual transit time for beef exported to the US, which should greatly reduce the level of risk.

- The 1997 risk analysis suggested that the slaughterhouse procedures used in Argentina were effective. Requirements for deboning and maturation remain in effect. Argentina's requirements for ante- and post-mortem inspection and maturation processes have been adopted into US regulations. There is no evidence that these mitigations have lost effectiveness or that Argentina is not in compliance. Therefore, these processes should be as efficacious today as they were in 1997.

Future developments that should reduce risk:

Several developments expected to occur in the near future should reduce the risk even further. The following projections are presented:

- Not only is FMD surveillance in Argentina at least as effective as it has been in the past, but also it is likely to become even more effective in the future. In this regard, Argentina intends to implement several actions to further reduce the probability that exported beef will contain FMD virus [1, 5]. Argentina has stated its intention to create a surveillance zone on its borders with Paraguay, Brazil, and Bolivia, within which animals cannot be slaughtered for export. Argentina intends to create a computerized database to maintain an accurate census of herds in the border zone. In addition, it will track all animal movements in the zone. Argentina intends to increase its enforcement of an existing ban on the feeding of food waste to swine. It will appoint a ministry veterinarian in each office authorized to issue livestock transit permits. It will individually identify all animals intended for export slaughter with an ear tag and check all ear tags for listing in transit guides. Although Argentina has provided no schedule for implementation of these actions, once implemented, they should reduce the level of risk.

  No data are available to estimate the frequency or magnitude of illegal animal movements into the country from adjacent regions that are affected with FMD.

Although it is likely that illegal cross-border movements of animals may continue, these actions should reduce its magnitude, and, therefore the level of risk.

- Argentina is committed assisting Bolivia and Paraguay with vaccination programs for FMD [5]. A vaccination program should constitute a significant step toward eradication of FMD in those countries. Any decrease in the prevalence of FMD in Bolivia or Paraguay should decrease the probability of FMD entering Argentina from these countries. This should, in turn, decrease the probability of FMD entering the US from Argentina.

- Argentina has discontinued vaccination officially, so the bovine population has become increasingly susceptible to FMD. Therefore, animals are likely to display clinical signs of FMD quickly if the disease appears. The fraction of the bovine population resistant to FMD and capable of being silent carriers is steadily decreasing which increases the probability that disease will be detected quickly and controlled. This decreases the risk.

Conclusion:

This analysis suggests that the evidence and assumptions applied to the 1997 risk assessment conducted by APHIS remain valid. The results of the 1997 analysis were used to establish a set of import conditions [4] that produced an acceptable level of risk in the release assessment, and APHIS accepted this level as applicable to the final risk estimation. APHIS has identified no information that would cause it to revise that evaluation. Since the release assessment in this qualitative assessment generated a level of risk that APHIS considered acceptable, exposure and consequence assessments were not conducted. APHIS considered the final risk estimate to be no more risky that the final risk estimate from the 1997 assessment.

In fact, the results of the 1997 analysis probably provide an overestimate of the risk. Therefore, the true frequency of imports of FMD-infected beef from Argentina may be less, and probably substantially less, than that calculated in the 1997 assessment.

Bibliography

1. Disease Information, Vol 13, numbers 30, 32-36, 39. Office International des Epizooties Internet home page: http://www.oie.int/eng/info/hebdo/AIS_24.HTM.

2. SENASA, Epidemiological Report: Serological Findings in Argentina, September 2000.

3. Argentine Beef Risk Assessment, United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services and Policy and Program Development, June 29, 1997.

4. Restrictions on importation of beef from Argentina. Title 9, Code of Federal Regulations, Part 94.21.

5. Argentina Site Visit Report from USDA, Animal and Plant Health Inspection Service, Veterinary Services Staff, conducted September 27-October 6, 2000.

6. Importation of Bovine Parts from Argentina, Docket No. 00-038-1, Wednesday, June 28. Federal Register, 2000. 65(125), pp. 39782-39784.

7. Trip Report and Site visit to Argentina and Uruguay, Animal and Plant Health Inspection Service, Veterinary Services, conducted November 11-26, 1994.

8. Guidelines for Risk Analysis: Office International des Epizooties. In: International Animal Health Code: Mammals, Birds and Bees, pp. 19-23, 1999.

9. Foot and Mouth Disease. In: Foreign Animal Diseases, United States Animal Health Association, pp. 213-224, 1998.

10. Foot and Mouth Disease: Office International des Epizooties. In: International Animal Health Code: Mammals, Birds, and Bees, pp. 63-73, 1999.